AIR QUALITY SURVEILLANCE BRANCH

STANDARD OPERATING PROCEDURES

FOR

Rupprecht & Patashnick Co., Inc.
Partisol-Plus Model 2025 Sequential Air Sampler
(R&P Sequential FRM)

AQSB SOP 404

First Edition

MONITORING AND LABORATORY DIVISION

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AIR RESOURCES BOARD

Approval of Standard Operating Procedures (SOP)

Title:	Rupprecht & Patashnick Co., Inc. Partisol-Plus Model 2025 Sequential Air Sampler (R&P Sequential FRM)
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RUPPRECHT & PATASHNICK
PARTISOL-PLUS MODEL 2025 PM-2.5 SEQUENTIAL AIR SAMPLER

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1.0 GENERAL INFORMATION

1.1 Introduction:

The purpose of these Standard Operating Procedures (SOP) is to supplement the manufacturer's Operator's Manual by describing modifications in hardware or procedures that may have been implemented by the Monitoring and Laboratory Division of the Air Resources Board. These modifications are designed to assure compliance with the Federal Reference Method for collection of particulate matter 2.5 microns or smaller (PM2.5) when using the Rupprecht & Patashnick (R&P) Partisol-Plus Model 2025 PM-2.5 Sequential Air Sampler.

1.2 General Description and Principles of Operation:

The Partisol-Plus 2025 Sequential Air Sampler is designed to meet the EPA requirements for PM2.5 sampling. The samplers filter magazines have a capacity of 16 filters. The sampler is fully microprocessor controlled. The sampler's internal datalogger can store 16 days of 5 minute data, 50 filter data records, and 32 days of 30 minute data.

Read Section 1 of the R&P Operating Manual and see Figure 1.2: System Schematic.

1.3 Safety Precautions:

Installation, operation, maintenance, and calibration of the sampler should only be performed by properly trained personnel. High (120 volts A.C.) voltages are used to power the unit. Due to typical rooftop installations, the risks of working outdoors at elevation should also be considered.

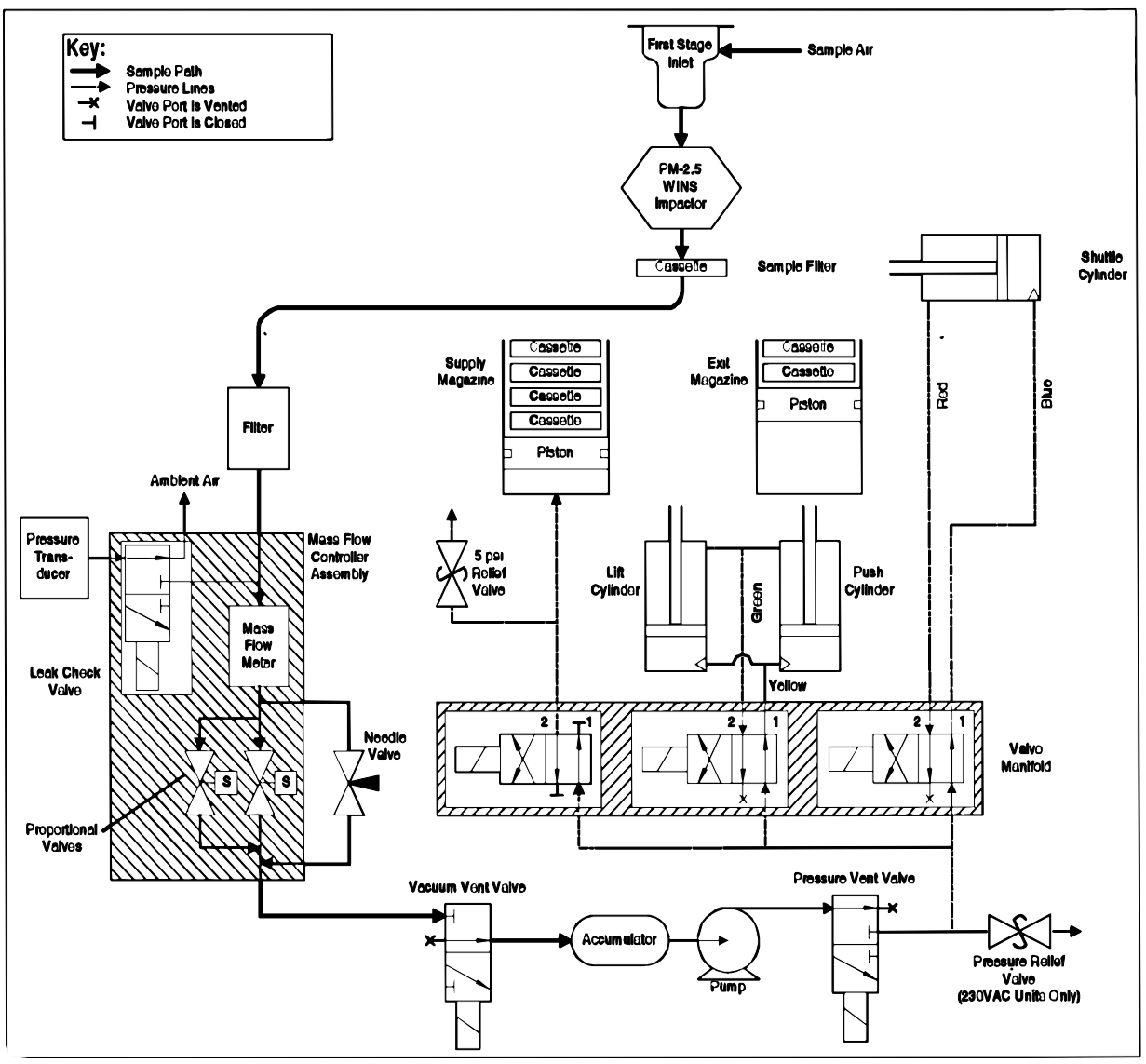

Figure 1. System Schematic.

2.0 INSTALLATION PROCEDURE

2.1 Physical Inspection:

Each R&P Partisol-Plus Model 2025 PM-2.5 Air Sampler should be supplied with the following supplies:

1 Partisol-Plus enclosure with WINS PM-2.5 impactor and filter exchange mechanism
1 1st stage PM10 Inlet
1 sample tube
3 rain hoods and associated hardware
1 flow audit adapter
3 filter cassette magazines
3 magazine transport containers
1 ambient temperature sensor and cable
3 sets of impactor wells and anti-spill rings
2 sets of inlet O-rings
1 bottle (100 milliliters (ml)) of WINS impactor oil
1 bottle (30 milliliters (ml)) of WINS impactor oil
3 box (25 count) of glass fiber impactor filters, 37 millimeter (mm)
1 AKCOMM software diskette
1 9-to-9 pin computer cable
2 Operating Manuals
2 Service Manuals
1 Quick Start Guide
1 cassette bulb pump
1 leak check plate
1 stand assembly
1 cassette removal sleeve

Upon receipt of the sampler(s), inspect sampler and accessories for shortage and for shipping damage. If shortage or damage is found, immediately notify your supervisor, and/or your agency's shipping department.

2.2 Rain Hood Installation:

There are three rain hoods that must be attached to the sampler. Attach the gaskets to the rain hoods by peeling the paper backing off of the gaskets and apply the gaskets to the appropriate rain hood. Install the rain hoods with the included thumbscrews. The two small rain hoods are interchangeable.

2.3 Temperature Sensor Installation:

Remove the phillips screws on the upper left side of the sampler. Use these screws to mount the temperature sensor. When mounting the temperature sensor, insert the washer and gasket between the sensor bracket and the enclosure, not under the head of the screw (see figure 2). Plug the three-pin connector into the connection marked “Ambient Temperature” on the back of the sampler.

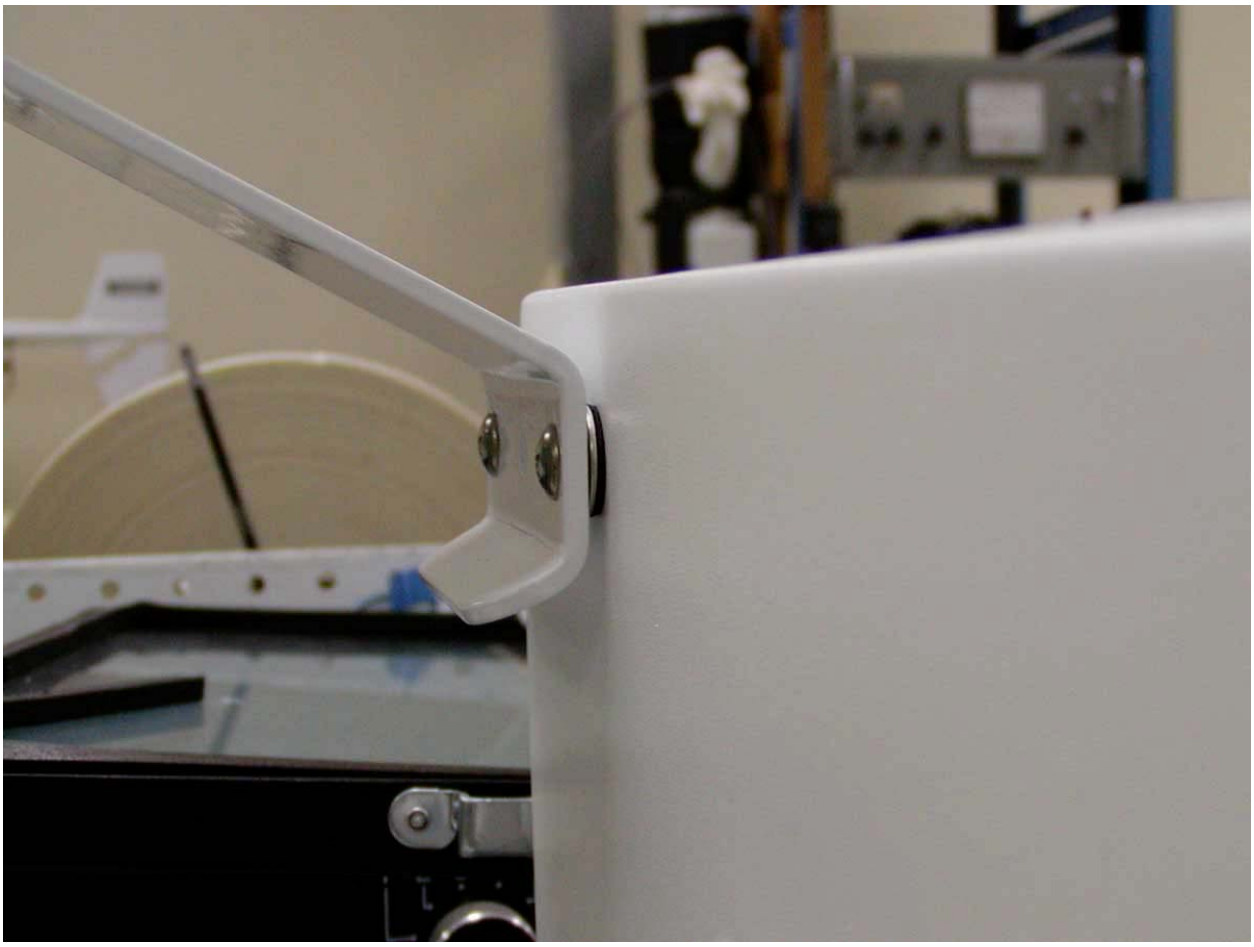

Figure 2. Ambient Temperature Sensor Installation.

2.4 WINS Impactor Installation:

Open the top cover of the sampler. Remove the WINS impactor by pulling it upwards. Unscrew the middle section of the impactor to expose the well. Remove the 37 mm filter if present and wipe down the well with a paper towel until there is no visible residual oil. Insert a new 37 mm filter and place 42-44 drops of impactor oil onto the filter. Reassemble the impactor and reinstall. Close and latch the top cover.

2.5 Very Sharp Cut Cyclone (VSCC) Installation:

Open the top cover of the sampler. Remove the WINS impactor if present. Install the VSCC by pushing it down completely on the mounting tube. Close and latch the top cover.

2.6 1st Stage Inlet Installation:

Insert the 1 ¼" OD sample tube into the instrument bulkhead. Ensure that the tube is pushed past both the lower and upper o-rings until it stops. Tighten the dome connector to ensure a tight and leak-free grip. Place the first stage inlet onto the tube. Make sure the inlet is inserted past the first and second o-rings until it stops.

2.7 Stand Assembly:

Follow the stand assembly diagram included with the sampler. The diagram can be found on page 2-5 in the operator's manual or in the quick start guide.

2.8 Supply Magazine Loading and Installation:

Obtain an empty magazine from its transport case. Remove the orange cap on the supply magazine. Use the bulb pump to move the piston in the supply magazine to the top of the magazine. The top of the piston should be level with the top edge of the canister. Detach the bulb pump from the magazine. Place one filter cassette on the piston and push it down until the top of the cassette is level with the top of the magazine. Repeat with additional filter cassettes if loading multiple filters. Note the order of filter placement from top to bottom for future reference. Replace the orange cap when finished to protect the filters from contamination. Place the magazine back in the transport case for transport to the site.

Open the sampler door to access the filter transport assembly. The left magazine mount is the supply side (clean filters). The right mounting position is the storage side (loaded filters). Remove the orange cap on the magazine. Align the grooves on the top of the cassette with the mounting studs on the left

mounting ring. Mount the magazine so that the hose connection faces outward. Push the magazine upward and twist counterclockwise to lock it in place. Connect the air supply tube to the supply (left) canister by pushing it onto the connector until it snaps into place. See Figure 3.

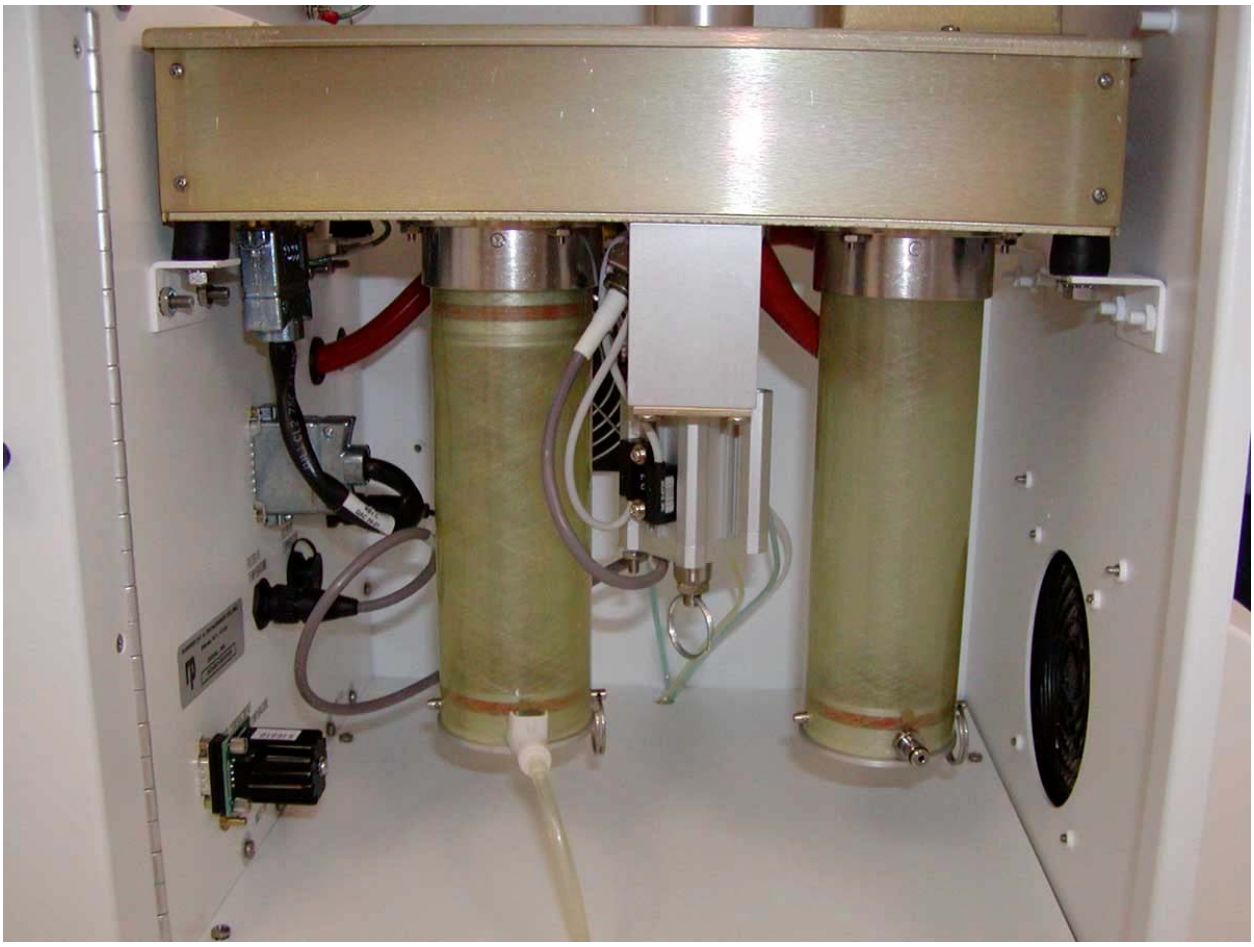

Figure 3. Sampler Compartment Layout.

3.0 CONFIGURATION

3.1 Sampling Train Operating Principles:

The sampling train transfers cassettes between parts of the sampling chamber at different times depending on the state of the sampler. If the sampler is placed into run mode from stop mode, the filter in the sampling position will move to the storage canister and the next filter in the supply canister will move into the sampling position at the sampling start time. In run mode, the sampler moves the sampled filter into the storage magazine at the end of the run. The next sampling filter is moved into the sampling position. When the next scheduled run starts the filter is already in place and no movement of filters occurs. If the sampler is set to run mode from audit mode, the sampler begins sampling with the filter currently in sampling position. Knowing the sampler's filter transport cycles is essential to avoiding sampling on the incorrect filter.

3.2 Main Screen and Menu Screen:

Most setup functions can be reached from the main screen on the sampler display. The exception is the service mode screen, which must be selected at the menu screen. To get to the main menu, press <Esc> until the main screen is reached. <Esc> can also be used to go back one screen. Pressing the <Menu> key at any time accesses the menu screen.

3.3 Clock and Time Setup:

Enter the main screen. Press <F5:Setup> to enter the Setup menu. Press <F5:System> to enter the system screen. Move the cursor to the "Curr Time" field and press <edit> to change the time. Move the cursor to the "Curr Date" field and press <edit> to change the date. The default date format is yy/mm/dd. Use the default date format. There may be software issues with other date formats.

3.4 Average Time Interval Setup:

The Average Time parameter in the System Setup field defines the time interval that is averaged by the sampler when storing data. 30 minute averages are the default.

3.5 Site Identification Setup:

Press <F3: Site ID> in the "System Setup" screen to enter the site identification screen. "ID1" and "ID2" can be edited to identify the site and sampler.

3.6 Resetting Status Codes:

Press <F2:Stats> in the main screen. The current and average values for temperature and pressure will be displayed. Pressing <F1:StCode> will bring up the status code display. Pressing <F1:Reset> will reset the status of the sampler and clear the error states.

3.7 Sample Set-up Procedures:

The following steps describe procedures for programming the R&P Partisol-Plus Model 2025 PM-2.5 Air Sampler for a sampling run. A loaded filter cassette must be installed prior to starting the sample run.

1. Place the sampler in the Stop operating mode (the right corner of screen shows STOP). Press <Run/Stop> to put sampler in STOP mode.

2. Press <F5:Setup> from the main screen.

3. Select the "BASIC" sample definition method. Set the sampling start time, sampling duration, repeat time, filter type, flow rate, flow error mode, and separator. Pressing <F2: Set EPA> programs settings for EPA FRM PM2.5 setting on a 1/1 schedule. If parameters other than the default settings are desired, use the arrow keys to move the cursor to the desired parameter and press <Edit> to change a parameter. The repeat time defines the time period in which the stored program repeats. It should be changed to 72 hours for 1:3 sampling and 144 for 1:6 sampling. Flow Error Mode "ERR" stops all sampling after a flow error code. Flow Error Mode "WAIT" stops sampling on flow errors and resumes sampling on the next programmed run.

4. Verify the "Set Flow" parameter is set to 16.7 lpm.

5. Press <ESC> to return to the main menu. Press <F3:FiltSet> to set the start date for the next run. The sampling program will repeat at the interval specified in the Setup menu.

6. Prepare a supply canister. Note the AIRS and LIMS numbers for each filter in the order that they are inserted in the canister, going from top to bottom.

7. In the "Filter Setup" menu press <F4:FilterLst>. Enter or verify that the site AIRS Number is in the ID1 field. Enter Filter LIMS Number (sample barcode number) in the ID 2 field. These values will be attached as a header to all data files pertaining to the associated sampling run. Press <ENTER> to accept information. Repeat for all the filters in the sampler. The entries should be done with the top filter in position 1 and the following filters in 2, 3, etc. (**Note: The Filter LIMS Number will need to be entered for each sampler run.)**

8. Press <ESC> key to return to main menu. Press <Run/Stop>. The "Mode:" flag in the right corner will display WAIT. The instrument is now in the wait mode and will begin sampling when the programmed start time is reached.

3.8 Resetting Memory:

Turn the sampler off and on. The sampler will display a startup screen before entering the main screen of the display. In the startup screen, press <F5: Reset>, then <F4: Yes> to reset the memory.

WARNING: RESETTING THE MEMORY ERASES ALL CALIBRATION AND SAMPLER SETTINGS AND RESTORES ALL SETTINGS TO DEFAULT VALUES. RESETTING THE MEMORY ERASES ALL STORED RUN DATA. USE THIS OPTION ONLY WHEN NECESSARY. RECORD ALL CALIBRATION OFFSETS BEFORE RESETTING TO AVOID RE-CALIBRATING THE SAMPLER AFTER RESET.

<F1: Rdfault> resets all sampler settings to the default values while retaining the run data stored in the internal datalogger. <F2: Rdata> deletes all stored run data in the internal datalogger while retaining the sampler settings.

4.0 DATA RETRIEVAL

4.1 General Information:

Field personnel will have the responsibility of ensuring the PM2.5 sampling information for each filter run is properly retrieved. The sampling information for the FRM samplers can be obtained either manually or electronically.

To manually record data, field personnel will complete a CARB 24-Hour Sample Report-Field Data Sheet, Appendix B (see attachment). The sample report will contain all information required by 40CFR58 Appendix L, Table L-1.

Electronic data can be downloaded via an RS-232 data output connection through which digital data will be exported to and external data storage or transmission device.

4.2 Manually Record Data:

Press <F4:Data> from the main screen. The data for the latest sampling period will be displayed onscreen. Other sampling runs can be accessed by pressing <F1:-Rec> and <F2:+Rec>. Additional data can be accessed by pressing <F3:MoreDat>, <F4:IntvDat>, or <F4:InptDat> in the Interval data screen. Record sample information in appropriate locations on the sample data sheet. After recording data, return to the main menu by pressing <ESC>.

4.3 Electronic Data Download Setup:

The Partisol-Plus Model 2025 PM2.5 Air Samplers have serial communications ports that can be used to communicate to PC's, modems, and printers. The Partisol-Plus Model 2025 PM2.5 Air Samplers communications use 8-N-1 protocol (8 stop bits, no parity, 1 stop bit). The default baud rate is 9600. However, the samplers are capable of communications over a large baud rate. The primary way to download data from the samplers is via laptop PC with RPComm. Data can also be downloaded using a terminal program such as hyperterminal but is not recommended.

4.4 Apparatus:

1. Laptop PC with communications software, terminal program, or RPComm software.

2. Serial cable with D-9 male plug with female pins on one end and a D-9 female plug with male pins on the other. The serial cable must be a "straight through" cable.

4.5 Download Procedure (Using RPComm):

1. Section 10 of the operator's manual contains detailed instructions for using the RPComm software. This procedure only outlines the necessary steps for a simple download. Refer to the manual for instruction on the advanced features of the RPComm software.

2. Connect the serial cable from the PC to the serial port on the sampler.

3. The sampler can be in any mode when using RPComm to download data. The RS232 port on the sampler must be set to AK protocol. AK protocol is the 2-way communication format for RPComm communication with R&P samplers. From the main screen press <F5: Setup>, then <F5:System>, then <F2: I/O>, then <F1: A/I>, and then <F3: RS232> to change the RS232 protocol.

4. Start RPComm. If a connection has not been defined for the Partisol-Plus 2025, create a connection. Choose New Connection from the file menu. Choose the 2025 sampler from the menu, and press the settings button. Make sure the software is set to 9600 baud, 8-N-1. See Section 10.2.2 in the operators manual for more information. Once a connection has been created, select the Connection Icon in the tool bar. A 2025 window should pop up with the serial number of the sampler at the top of the window if the connection is successful. If the 2025 window does not have a serial number, recheck the connection settings and try again.

5. To download data, select the download data tab. Set the storage pointer to the appropriate place if necessary (see section 10.2.3 in the operators manual for more information) and then select the appropriate data set icon in the menu bar. Select either the "Download all data" or "download from storage pointer" icon to begin the download. See section 10.2.3 "Downloading Stored Data" for more information.

6. The RPComm software has many other features designed specifically for the 2025, including a virtual keypad and the ability to define filter lists for the sampler. See section 10 "Direct Communications Using RPComm" for additional information.

4.6 Download Procedure (Using Hyperterminal):

1. Connect the serial cable from the PC to the serial port on the sampler.

2. Open hyperterminal or another terminal program and configure it to operate using the N-8-1 protocol and baud rate set on the sampler (default value 9600). Enable the text logging capability of the software package.

3. The RS232 port communication protocol must be set to “AK” to download the data for a completed run manually. From the main screen press <F5: Setup>, then <F5: System>, then <F2: I/O>, then <F1: A/I>, and then <F3: RS232> to change the RS232 protocol. Refer to sections 9.2 to 9.5 in the manual for more details on the parameter settings and their functions. The “protocol” parameter should be changed to AK. Press <Esc> to go back to the main screen. Press <F4: Data> to enter the filter data screen. Use the <F3: MoreDat> and <F4> keys to navigate to the desired data. Press the <F5: DwnLoad> button to begin downloading data. Pressing <F5: DwnLoad> before the transfer is complete interrupts the download. The event summary information is found in the filter data set.

4. The terminal window of the communications software should show the data being transmitted.

5. After transmission is completed, disable the file capture capability of the communications software to close the capture file. Disconnect serial cable from the sampler and PC. Return the sampler to the main menu.

6. The data is downloaded as a comma-separated text file. Most commercial spreadsheet programs can convert these files to spreadsheets.

7. The downloaded data from hyperterminal contains no data headers. The order of the data can be found in sections 9.3-9.5.

5.0 DATA SUBMITTAL (Field to Laboratory)

5.1 General Information:

Once field personnel have retrieved sampling information either manually or electronically, the data will be forwarded to the laboratory. If the sampling information was recorded manually, the CARB 24-Hour Sample Report-Field Data Sheet will accompany the sampled filter(s) to the laboratory. If the sampling information was recorded electronically, the sampling information will be sent to the lab via file transfer protocol. An abbreviated 24-Hour Sample Report-Field Data Sheet will still accompany the sampled filter(s) to document chain-of-custody and additional sampling information.

5.2 Sample Chain-of-Custody:

The chain-of-custody process begins once the filter is pre-conditioned and inspected by laboratory personnel. After pre-conditioning is complete, filters will be pre-weighed, placed in filter rings and prepared for shipping. Each filter will be associated with a bar code number that will be attached to a 24-Hour Sample Report-Field Data Sheet (Appendix B). Laboratory personnel will annotate the pre-weight of the filter, date and initials on the 24-Hour Sample Report-Field Data Sheet. The sample report sheet and filter will be shipped to the field. Within 30 days of pre-conditioning, the filter will be used for sampling. When the filter is loaded on the sampler, field personnel will document the date, time, and name of person loading the sampler. After sampling, field personnel will document date, time and name of personnel removing the sample from the sampler. The temperature of the filter will also be documented at this time. If the filter is not being shipped to the laboratory right away, the filter will be place in a refrigerator for storage until shipping. Field personnel will document date, time and filter temperature when the filter is placed in refrigerator. When the filter is shipped to the laboratory, the date, time, filter temperature and personnel shipping the filter will be documented on the sample report. When the filter arrives at the laboratory, the date, time, filter temperature and person receiving the filter will be noted on the sample report. Laboratory personnel will then enter the filter information into the Laboratory Information Management System (LIMS). LIMS will generate a LIMS sample identification number that will be documented on the sample report. The filter will then be prepared for post conditioning or placed in a refrigerator for storage until post-conditioning. The date, time, filter temperature and name of analyst will be documented once post-conditioning begins.

6.0 SAMPLE FILTER HANDLING PROCEDURES

6.1 General Information:

Federal regulations stipulate specific time frames and environmental conditions for FRM PM2.5 sample filters at various stages in the sampling program. If these time frames and conditions are not met, sample filters may be flagged or invalidated by the receiving laboratory. In addition to these requirements, operators should practice the usual care to prevent or minimize contamination of the sample filters, filter cassettes, or anything else which may come in contact with the sample filters.

6.2 Presampling Filter Handling Procedures:

Sample filters must be used within 30 days of the preweighing procedure. Sample filter temperature must be within 5 ^{o}C of ambient temperature while installed in the sampler.

6.3 Post sampling Filter Handling Procedures:

Sampled filters must be removed from the sampler within 96 hours of the end of sampling and placed in cold storage as soon as practical.

Sampled filters must be kept at a temperature of less than 4 °C during storage and shipping which allows the laboratory up to 30 days from the end of sampling for analysis. If this temperature is exceeded but is kept at no greater than 25 ^{o}C, the laboratory has up to 10 days to analyze.

The storage environment will have its temperature constantly monitored and recorded.

Sampled filters and CARB 24-Hour Sample Report-Field Data Sheets will be shipped in an insulated shipping container containing sufficient Blue Ice or other chilled media to assure that sample filters arrive at the laboratory at a temperature no greater than 25 °C or preferably 4 °C. Other methods may also be employed if they comply with these requirements.

Shipping containers will contain a min/max thermometer, temperature data logger, irreversible temperature indicators (3M, 5 °C and 26 °C) or other suitable means to determine whether temperature requirements of the sample filters have been exceeded during transit. This requirement also applies when sampled filters are being transported from remote or satellite sites to central or main locations.

Sampled filters will be shipped to the laboratory weekly on Monday, Tuesday, Wednesday or any other day that avoids Saturday or Sunday arrivals as well as assures a short as possible transit time.

6.4 Filter Blank Handling Procedures:

Upon receipt and identification of filter blanks, treat these filters the same as filters to be sampled with the exception that they will not be used to collect samples. They are to be installed in the sampler for the same time period as a filter sample, stored in a cooler and returned to the laboratory with the sampled filters. Fill out the CARB 24-Hour Sample Report-Field Data Sheet with exception of run data and submit with rest of sample reports.

7.0 CALIBRATION OVERVIEW

7.1 Introduction:

This section describes the calibration procedure for the Rupprecht & Patashnick Partisol-Plus Model 2025 PM-2.5 Air Sampler (R&P PM2.5 FRM). The procedures listed are in reference to the R&P FRM Operating Manual and are not intended to replace the operating manual.

7.2 Overview:

The calibration of the fine particulate matter samplers whose mass has an aerometric diameter of less than 2.5 microns (PM2.5) must be performed on a six month basis. There are several parameters that must be calibrated with this new generation of fine particulate matter samplers. These parameters include flow or volume, temperature, pressure and time.

The calibration procedure in Section 3 of the R&P Service Manual is fairly complete, accurate and easy to follow. The primary purpose of the verification/calibration is to determine and/or verify that the volumetric flow of the PM2.5 sampler is at 16.67 liters per minute (LPM), or that the sampler collects a volume of 1 cubic meter of air per hour. Refer to 40 CFR Part 50, Appendix L for further information.

7.3 Apparatus for R&P PM2.5 FRM Sequential Channel Sampler Calibration:

NIST-traceable flow transfer standard
NIST-traceable temperature standard
NIST-traceable pressure standard
R&P inlet flow adapter
Calibration forms or laptop computer
Empty filter cassette
Leak check filter cassette with filter
Leak check plate and filter cassette

8.0 CALIBRATION PROCEDURE

8.1 General Information:

The calibration of the R&P PM2.5 FRM sampler should be performed in the following steps:

1. Temperature sensor calibrations
2. Pressure calibration
3. Leak test
4. Flow calibration
5. Verify calibration parameters

All calibration information and data will be recorded on the Calibration Data Sheet (Appendix C).

8.2 Ambient Temperature Sensor Calibration:

Press <Esc> until the sampler is in the Main Screen. The device must be in the "Stop" Operating Mode to perform an ambient temperature sensor calibration.

1. Press <Menu> and select "Enter Service Mode", then choose "calibration/audit" when in the Service Menu to access the calibration screen. Press <F3: SensCal>.

2. Place the reference thermometer in the radiation shield of the ambient temperature probe. Determine the current temperature in ^{o}C at the ambient temperature sensor using the reference thermometer.

3. Use the arrow keys to move the cursor to the Actual column in the "Amb Temp" row. Hit <Edit> to change the entry.

4. Enter the current temperature in ^{o}C and press <ENTER> to leave the edit mode.

5. Upon receiving the actual temperature, the system's microprocessor automatically computes the offset for the ambient temperature sensor.

8.3 Filter Temperature Sensor Calibration:

1. Press <Menu> and select service mode, then choose "calibration/audit" when in the Service Menu to access the calibration screen. Press <F4: FiltCal>.

2. Remove the filter temperature probe and place it in close proximity to the reference thermometer. Determine the current temperature in ^{o}C at the location of the sample filter in the FRM using the reference thermometer.

3. Use the arrow keys to move the cursor to the Actual column in the “Filter” row. Hit <Edit> to change the entry.

4. Enter the current temperature in ^{o}C and press <ENTER> to leave the edit mode.

5. Upon receiving the actual temperature, the system’s microprocessor automatically computes the offset for the filter temperature sensor. Note this number for future reference.

8.4 Filter Compartment Temperature Sensor Calibration:

1. Press <Menu> and select service mode, then choose “calibration/audit” when in the Service Menu to access the calibration screen. Press <F4: FiltCal>.

2. Place the reference thermometer in close proximity to the filter compartment sensor. Determine the current temperature in ^{o}C at the location of the filter compartment temperature sensor in the FRM using the reference thermometer.

3. Use the arrow keys to move the cursor to the Actual column in the “Filter Comp” row. Hit <Edit> to change the entry.

4. Enter the current temperature in ^{o}C and press <ENTER> to leave the edit mode.

5. Upon receiving the actual temperature, the system’s microprocessor automatically computes the offset for the filter temperature sensor. Note this number for future reference.

8.5 Barometric Pressure Calibration:

1. Press <Menu> and select service mode, then choose “calibration/audit” when in the Service Menu to access the calibration screen. Press <F3: SensCal>.

2. Determine the current ambient barometric pressure in mm Hg with the NIST-traceable pressure standard.

3. Use the arrow keys to move the cursor to the Actual column in the “Amb Pres” row. Press the <Edit> key to change the entry.

4. Enter the current pressure in mm Hg and press <ENTER> to leave the edit mode.

5. Upon receiving the actual pressure, the system’s microprocessor

automatically computes the offset for the ambient pressure sensor. Note this number for future reference.

8.6 Leak Check:

Before verifying/calibrating the flow of the sampler it is important to ensure that the sampling train does not have a leak. Internal and External leak checks should be performed. Additional information can be found in sections 12.1.5 and 12.1.7 in the operator's manual.

8.7 External Leak Check:

1. Insert the leak check filter cassette into the supply filter magazine. This cassette should contain a filter and the support screen.

2. If the sampler is in "Run" mode, press <Run/Stop> and place the sampler in audit mode. If the sampler is in "Stop" mode, press <menu> and choose service mode. In the service menu, press <F1: Audit>. If the sampler is in "Audit" mode, press <Menu> and choose the audit selection. Press <F4:FiltAdv> to place the leak check cassette in the sampling chamber.

3. Remove the PM10 inlet and place the flow audit adapter on the sample tube. Close the adapter inlet.

4. Press <F5: LeakChk> to display the leak check screen.

5. Choose "external" for the type.

6. Press <F2: Start> to begin the leak check.

7. Press <F1:External> to start the external leak check sequence.

8. Press <F1: Yes> at the "Filter in place" screen.

9. Follow the onscreen instructions. The sampler will display either a pass or fail message when complete as well as a pressure drop value.

10. If fail is displayed, check the leak check cassette for filter holes or malfunctions and repeat the test. If it fails again, the unit needs servicing.

11. If a "pass" message is displayed, slowly open the valve on the flow audit adapter and replace the PM10 inlet.

12. Record the leak rate on the calibration worksheet.

8.8 Internal Leak Check:

1. Prepare a leak check cassette by inserting the leak check plate into a filter cassette. This cassette should only contain the leak check plate. No filter or screen should be in the cassette.

2. Insert the leak check cassette into the supply magazine.

3. If the sampler is in “Run” mode, press <Run/Stop> and place the sampler in audit mode. If the sampler is in “Stop” mode, press <menu> and choose service mode. In the service menu, press <F1: Audit>. If the sampler is in “Audit” mode, press <Menu> and choose the audit selection. Press <F4:FiltAdv> to place the leak check cassette in the sampling chamber.

4. Press <F5: LeakChk> to begin the leak check.

5. Select <F2: Internal> to start the internal leak check sequence.

6. Press <F1: Yes> at the “Cassette in place” screen.

7. Follow the onscreen instructions. The sampler will display either a pass or fail message when complete as well as a pressure drop value.

8. If a fail message is displayed, check the leak check cassette and repeat the test. If it fails again, the unit needs servicing.

9. If “pass” is displayed, slowly open the valve on the flow audit adapter and replace the PM10 inlet.

10. Record the leak rate on the calibration worksheet.

8.9 Flow Rate Calibration:

The flow rate of the R&P PM2.5 FRM sampler must be 16.67 LPM to correctly select particulate matter smaller than 2.5 microns in diameter. The purpose of the flow rate calibration is to ensure that the sampler draws the correct volumetric air flow rate. Section 3.2.8 of the R&P PM2.5 FRM Service Manual discusses the sampler flow calibration. The sampler must be in the STOP mode to perform a calibration. The R&P PM2.5 FRM sampler is flow rate calibrated by testing the flow rate at 3 points using a NIST-traceable flow meter.

1. Carefully remove the PM10 inlet from the sampler.

2. Install a filter cassette into the supply cassette.

3. Enter the service mode by pressing the <Menu> key and selecting the "Service Mode" option. Select the "System Maintenance Routines" and press <F1: Audit>. Press <F4: FiltAdv> to place the leak check filter cassette into the filter chamber.

4. Return to the Service Menu. Select the "Calibration/Audit" option.

5. Display the Flow Calibration Screen by pressing <F5:FlowCal>.

6. If using a Streamline FTS flow transfer standard, enter the m and b constants of the FTS into the "Const m" and "Const b" parameters.

7. Remove the PM10 inlet and place the transfer standard onto the sample tube.

8. Edit the desired minimum and maximum flow rates as well as the number of calibration points desired using the arrow and edit keys.

9. Press <F5: More> and then <F4: Start> to begin sampling.

10. Wait for the flow to stabilize. Press <Edit> and enter the pressure drop (inches H20) if using the Streamline FTS in the "pressure" parameter, or enter the volumetric flow in the "Act. Flow" parameter if using another standard. Press <Enter>. The sampler will move on to the next calibration point. Repeat this step until the sampler has completed all the points.

11. Once all points have been complete, the sampler will adjust the Offset and Span values automatically.

12. Remove the flow transfer standard and reinstall the PM10 inlet.

8.10 Clock/Timer Verification:

Units of time are used in several aspects of sampler operation. Examples are the start and stop times, volume/flow calculations, run dates, etc. Therefore, it is necessary to document the time setting of the sampler.

Observe the sampler time from the Main Screen. Enter this value onto the calibration data sheet. At the same time, enter the value of your time keeping device. Identify your time keeping device on the calibration data sheet.

Include the make, model, ID number, date last certified, and bias of your clock.

The requirement in 40 CFR Part 50, Appendix L, Section 7.4 states that the sampler must not loose more than 1 minute per month.

If the sampler is off by more than ±10 minutes from true time, reset the system

clock.

To reset the clock, from the Main Screen select <F5: Setup>, then select <F5: System>. Enter the correct time to ± 1 minute from true. Enter the corrected time on your calibration data sheet.

Enter all data on the appropriate datasheets and record any repairs or changes for future reference.

9.0 VERIFICATION PROCEDURES

9.1 General Information:

If the sampler is in "Run" mode and is currently sampling, do not use place the sampler into "Stop" mode. Placing the sampler in "stop" mode will result in the loss of the current sampling event. All of the following verification procedures can be done in the "Audit" mode that allows the user to resume the sampling event.

9.2 Ambient Temperature Sensor Verification:

1. Press <Esc> until the sampler is in the Main Screen. The device should be in the Audit Operating Mode to perform ambient temperature sensor verifications.

2. If the sampler is in “Run” mode, press <Run/Stop> and place the sampler in audit mode. If the sampler is in “Stop” mode, press <menu> and choose service mode. In the service menu, press <F1: Audit>. In Audit mode, press <Menu> and choose the audit selection.

3. Place the reference thermometer in the radiation shield of the ambient temperature sensor. Determine the current temperature in ^{o}C at the ambient temperature sensor using the external thermometer.

4. Verify that the value for the temperature displayed as Ambient Temp in the Audit Screen is within ±2 ^{o}C of the external thermometer.

If the ambient temperature sensor reading is not within ±2 ^{o}C of the external thermometer, the ambient temperature sensor must be re-calibrated. Follow the steps in section 8, Calibration Procedures for more information.

9.3 Filter Temperature Sensor Verification:

1. Press <Esc> until the sampler is in the Main Screen. The device must be in the Audit Operating Mode to perform the ambient temperature sensor verification.

2. Remove the filter temperature sensor by releasing it from the quick release. Place the reference thermometer as close as possible to the temperature sensor and allow them to equilibrate.

3. Determine the current temperature in ^{o}C at the location of the sample filter in the FRM.

4. Verify that the value for the temperature displayed as Filter Temp in the Audit Screen is within ±2 ^{o}C of the external thermometer.

5. If the filter temperature sensor reading is not within ±2 ^{o}C of the external thermometer, the filter temperature sensor must be re-calibrated. Follow the steps in section 8, Calibration Procedures for more information.

9.4 Filter Compartment Temperature Sensor Verification:

1. Press <Esc> until the sampler is in the Main Screen. The device must be in the Audit Operating Mode to perform the ambient temperature sensor verification.

2. If the sampler is in "Run" mode, press <Run/Stop> and place the sampler in audit mode. If the sampler is in "Stop" mode, press <menu> and choose service mode. In the service menu, press <F1: Audit>. In Audit mode, press <Menu> and choose the audit selection.

3. Determine the current temperature in ^{o}C at the location of the filter compartment sensor in the FRM using the external thermometer. The sensor is clearly labeled and is located along the inner left wall of the compartment.

4. Verify that the value for the temperature displayed as Filter Comp Temp in the Audit Screen is within ±2 ^{o}C of the external thermometer.

5. If the filter temperature sensor reading is not within ±2 ^{o}C of the external thermometer, the filter temperature sensor must be re-calibrated. The calibration procedure can be found in section 8, Calibration Procedures.

9.5 Barometric Pressure Verification:

1. Press <Esc> until the sampler is in the Main Screen. The device must be in the Audit Operating Mode to perform a barometric pressure sensor calibration verification.

2. If the sampler is in "Run" mode, press <Run/Stop> and place the sampler in audit mode. If the sampler is in "Stop" mode, press <menu> and choose service mode. In the service menu, press <F1: Audit>. If the sampler is in "Audit" mode, press <Menu> and choose the audit selection.

3. Determine the current ambient barometric pressure in mm Hg.

4. Verify that the value for the "Ambient Pres" parameter in the Audit Screen is within ±10 mmHg of the measured ambient pressure.

5. If the sampler ambient pressure is not within ±10 mmHg of the measured

ambient pressure, the barometric pressure sensor must be re-calibrated. The calibration procedure can be found in section 8, Calibration Procedures.

9.6 Leak Check:

Before verifying/calibrating the flow of the sampler it is important to ensure that the sampling train does not have a leak. External leak checks should be performed during the verification procedure. Additional information can be found in sections 12.1.5 and 12.1.7 in the operator's manual.

9.7 External Leak Check:

Insert the leak check filter cassette into the supply filter magazine. This cassette should contain a filter and the support screen.

1. If the sampler is in "Run" mode, press <Run/Stop> and place the sampler in audit mode. If the sampler is in "Stop" mode, press <menu> and choose service mode. In the service menu, press <F1: Audit>. If the sampler is in "Audit" mode, press <Menu> and choose the audit selection. Press <F4:FiltAdv> to place the leak check cassette in the sampling chamber.

2. Remove the PM10 inlet and place the flow audit adapter on the sample tube. Close the adapter inlet.

3. Press <F5: LeakChk> to display the leak check screen.

4. Choose "external" for the type.

5. Press <F2: Start> to begin the leak check.

6. Press <F1:External> to start the external leak check sequence.

7. Press <F1: Yes> at the "Filter in place" screen.

8. Follow the onscreen instructions. The sampler will display either a pass or fail message when complete as well as a pressure drop value.

9. If fail is displayed, check the leak check cassette for filter holes or malfunctions and repeat the test. If it fails again, the unit needs servicing.
10. If a "pass" message is displayed, slowly open the valve on the flow audit adapter and replace the PM10 inlet.

11. Record the leak rate on the appropriate worksheet.

9.8 Flow Rate Verification:

Press <Esc> until the sampler is in the Main Screen. The device must be in the Audit Operating Mode to perform a flow rate calibration verification.

1. If the sampler is in “Run” mode, press <Run/Stop> and place the sampler in audit mode. If the sampler is already in “Stop” mode, press <menu> and choose service mode. In the service menu, press <F1: Audit>. In Audit mode, press <Menu> and choose the audit selection.

2. Install the filter cassette containing a 47 mm filter into the supply filter magazine.

3. Press <F4: FiltAdv> to place the a filter cassette into the flow path. This cassette should contain a filter and the support screen. Select the “Calibration/Audit” option.

4. Carefully remove the PM10 inlet from the sampler.

5. Attach the transfer standard to the sampler.

6. If the Streamline FTS flow transfer standard is being used, enter the m and b of the standard in the “Const m” and “Const b” on the display.

7. Turn on the pump by pressing <F1: Pump>, and then turn on the sample flow valve by pressing <F2: Valve>.

8. Determine the flow in units of actual (volumetric) LPM using the flow rate verification device. If the Streamline FTS is being used, enter the pressure drop in inches of H2O in the “FTP Pres” selection. The calculated volumetric flow will be displayed in the “FTS flow” parameter.

9. Verify that the value for the flow rate displayed in the Flow Rate field of the Audit Screen is within ±4% of the flow rate verification device.

10. If the flow rate reading is not within ±4% of the flow rate verification device, a flow rate calibration must be performed.

11. Finish the flow check by Pressing <F2: Valve> and then <F1: Pump> to shut off the flow. Remove the transfer standard and install the PM10 inlet.

10.0 ROUTINE SERVICE CHECKS

10.1 General Information:

See section 11 of this document "Maintenance Procedures" and Appendix G of the Operator's manual "Maintenance of Inlets" for further routine service check information.

10.2 Daily Checks:

After each run, review summary data for compliance with Measurement Quality Objectives for FRM PM2.5. Complete and return the sample report form with the appropriate filter. Inspect WINS impactor and clean if necessary. See section 11.4 "PM2.5 WINS Impactor Maintenance" in this document for more information.

10.3 Weekly Checks:

Inspect the water trap on the PM10 inlet and empty if necessary. Ship sampled filters.

10.4 Bi-Weekly Checks:

Perform flow verification checks. The flow rate should be within ±4% of the transfer standard.

10.5 Monthly Checks:

1. Disassemble, clean and inspect PM10 inlet.
2. Check the o-rings and replace if necessary on the PM10 inlet.
3. Check "V" seals at the top and bottom WINS impactor junctions.
4. Clean interior compartment and the sample downtube.
5. Clean or replace air intake filters.
6. Clean VSCC inlet.
7. Perform temperature sensor verifications for both the filter and ambient sensors. The sensors should be within ±2 °C of the transfer standard. Perform pressure sensor verification. The pressure sensor should be within ±10 mm Hg of the transfer standard.

8. Perform a clock and date verification check. The clock should be within ±10 minutes of the time standard and the date should be correct. Record results for all verification procedures. Perform leak check and record results.

10.6 Semiannual Checks:

Clean the screens under the rainhoods. Check the particle trap filter and replace as necessary. Perform temperature, pressure, flow, and clock calibrations.

11.0 MAINTENANCE PROCEDURES

11.1 General Information:

Read the operators manual for more detailed information regarding sampler maintenance.

11.2 Sampler Maintenance:

The sampler should be wiped down with a clean wet cloth when required. Clean the filter compartment with a wet cloth when required. Clean the sampler downtube as necessary. Check "V" seals and replace when necessary. See operators manual, section 3.1.5. "Inspect V Seals" for more information.

11.3 PM10 Inlet Maintenance:

Clean the PM10 inlet as necessary. Refer to section G.1. in the operators manual for further instructions.

11.4 PM2.5 WINS Impactor Maintenance:

Determining the state of the WINS impactor requires removing the impactor and examining the particulate cone in the impactor well. If the cone is more than 2 cm tall or the if the top of the cone has broken off the WINS impactor needs cleaning to minimize re-entrainment of particles larger than 2.5 microns. Refer to section G.3. for further instructions on the cleaning procedure.

11.5 VSCC Maintenance:

The VSCC should be cleaned once a month. Disassemble the entire VSCC and clean with a kimwipe or compressed air. Check all o-rings for wear or damage and replace if necessary.

12.0 TROUBLESHOOTING

12.1 General Information:

If review of the R&P Operating Manual does not result in correction of the problem, notify your area engineer, specialist, and/or repair facility technician.

12.2 Filter Cassette Problems:

Using the proper filter cassettes is critical in this sampler. If the wrong filter cassettes are used, the sampler will jam. The proper filter cassettes have a beveled edge along the top outer rim of the ring. If the edges of the filter cassettes are unbeveled, contact the laboratory for replacements.

CALIFORNIA AIR RESOURCES BOARD
MONTHLY QUALITY CONTROL MAINTENANCE CHECK SHEET
R&P PARTISOL-PLUS MODEL 2025 PM-2.5 AIR SAMPLER

Site Name: _____ Month/Year: _____
Site Number: _____ Sampler I.D. Number: _____
Agency: _____ Sampler Serial Number: _____
Operator: _____ Primary, Collocated, Audit, or Other: _____

Maintenance Instructions for Daily Sampling:

After Each Run: Remove sampled filter; Download, record, and review sample data; Inspect WINS impactor and clean if necessary; Install new sample filter; Program sampler for next run.

Weekly: Inspect water collector bottle and drain if necessary; Ship sampled filters along with the sample data to the originating laboratory.

Monthly: Disassemble, clean, and inspect O-rings of PM10 inlet; Clean interior cabinet and downtube; Clean or replace air intake filters; Inspect "V" Seals; Perform flow, temperature, pressure, and clock verification checks and record results; Perform leak check and record results. DATE LAST PERFORMED: _____
FORWARD THIS CHECK SHEET AND COPIES OF ALL SAMPLE FIELD DATA SHEETS TO SECOND LEVEL REVIEWER.

Semiannually: Perform flow, temperature, and pressure calibrations; DATE LAST PERFORMED: _____

Results

ACTION	Indicated	Actual	Sampler	% Difference	Control Limits*
Flow Rate					16.50 to 16.83 L/min
Ambient Temp.					±2 °C
Ambient Press.					±10 mm Hg
Filter Temp.					±2 °C
Clock Time					±1min/mo
Leak Check					<25 mm Hg

*If check exceeds limits, investigate to determine cause and repeat check at later time or date.
If second check also exceeds limits, request a re-calibration.

Standards

Standard	Make/Model	Serial/I.D.Number	Date Certified	Slope	Intercept
Flow Rate					
Temp.					
Pressure					
Clock					

Appendix A. Monthly Quality Control Maintenance Check Sheet

CARB 24 Hour – FIELD SAMPLE REPORT
Federal Reference Monitor (FRM) PM 2.5 Samplers

Bar Code:
LIMS Sample ID:

Site Name: _____
AIRS Site Number: _____
Field Technician: _____
Agency: _____

Cassette I. D. Number: _____
Scheduled Sampling Date: _____
Sampler Property #: _____

SAMPLE SUMMARY

Start Date / Time: _____ / _____
Total Elapsed Time: _____ Hr:min
Volume: _____ M^3
Flow CV: _____ %

	MIN	AVG	MAX
Ambient Temp(°C):			
Filter Temp (°C):			
Pressure (mmHg):			

Local Condition Codes: _____

Sampler Flag Codes: _____

A.	High Winds	E.	Forest Fire
K.	Farming Nearby	J.	Construction Nearby
N.	Sanding/Salting Streets	L.	Highway Construction
P.	Roofing Operations	Q.	Prescribe Burn

F.	Flowrate 5-min average, out of spec
T.	Filter Temp differential, 30 minutes interval out of spec
E.	Elapsed sample time, out of spec

Operator Comments: _____

Chain of Custody

ACTION	DATE	TIME	FILTER TEMP °C	NAME
Sample Load				
Sample Removal				
Sample placed in freezer				
Sample shipped to Lab				
Sample received at Lab				
Start post-conditioning				

FOR LABORATORY USE ONLY

Postweigh by: _____

	Mass:	Dup Mass:	Date:	Analyst:
Preweight				
Postweight				

Lab Comments:	

Appendix B. PM2.5 Field Data Sheet

R&P Partisol-Plus 2025 PM2.5 Sampler

ID Information:		Instrument:	
Station Name:	Sacramento	Make:	R&P
ARB Station Number:	xxxx	Model #:	Model 2025
Station Address:	1927 13th St	Property #:	20020022
Agency:	ARB	Serial #:	5524
Operator:			

Calibration:	
"As Is"	X
"Final"	X
Calibration Date:	04/15/02
Report Date:	04/15/02
Prev. Cal. Date:	NA

Pressure/Temperature STD:	
Make & Model:	BGI Deltacal
Property Number:	20020853
I.D. #:	981133
Cert. Date:	01/29/98
Cert. Exp.:	01/01/00

Time Standard:	
Make & Model:	Casio
Identification No.:	
Cert Date:	

Time:	Sampler:	Standard:
Date:	3/7/01	3/7/01
Hours:Minutes:Secs	10:30:00	10:28:48

Temperature: (deg. C)			Differ. from True:	% Difference	Span	Offset
Ambient	23.5	23.7	0.2	0.84	1.02	2.2
Filter	25.1	24.8	-0.3	-1.21	1.05	1.5

Pressure: (mm Hg)			Differ. from True:	% Difference	Span	Offset
Ambient	760	761	1.0	0.13	1	1.01

Leak Test: (LPM)	Pressure Drop (mm Hg)
External	10.0
Internal	10.0

Target Volumetric Flow (LPM)	Sampler Display:	Transfer Standard Display:	Volumetric Flow vs Design Flow: (+/- Percent)	Volumetric Flow vs Sampler Display (+/- Percent)	Span	Offset
15	15.00	15.02	0.00	-0.13	2.3	0.85
16.7	16.70	16.80	0.00	-0.60	2	0.9
18	18.00	17.90	0.00	0.56	2.5	0.7

Comments:			
Calibrated by:	MPQ	Checked by:	

Appendix C. R&P Sequential FRM Calibration Worksheet